

# **“Science isn’t just what we learn in school”: Interaction Rituals That Value Youth Voice in Out-of- School-Time Science**

Allison J. Gonsalves  
*McGill University*

## **Abstract**

In this article, I explore what happens when digital media activities designed to stimulate science conversations are introduced to an out-of-school-time (OST) space usually reserved for talks about girls’ issues. The goals of this study were to provide a space that values youth voice and creates positive emotional energy around science-related subjects. In this article, I identify episodes of interaction rituals that provoke positive emotional energy toward science among a group of adolescent girls in a community centre in a low-income urban neighbourhood. Results highlight moments when youth mobilize their funds of knowledge and demonstrate emotionally positive charged engagement with science. I then conclude with an exploration of the limitations of shifting ideas about what counts as “real science” and the implications for science teaching both in and out of the classroom.

*Keywords:* science education, out-of-school-time (OST), positive emotional energy, funds of knowledge, youth voice

## Résumé

Cet article explore ce qui s’est passé lorsque des activités médiatiques digitales, destinées à stimuler les conversations à propos des sciences, ont été intégrées à un programme parascolaire habituellement réservé aux conversations entre adolescentes. Les objectifs de cette étude étaient de fournir un espace valorisant les voix des jeunes et créant une charge affective positive envers les sujets scientifiques. Cet article identifie les épisodes d’interaction ayant provoqué une charge affective positive envers les sciences chez un groupe d’adolescentes, dans un centre communautaire situé dans un quartier urbain défavorisé. Nous identifions les moments d’engagement positif avec la science grâce à la mobilisation de «fonds de connaissance» et par leurs «répertoires de pratique». Cependant, nous identifions également les limites des tentatives de changer ce qui est perçu comme «la vraie science» ou comment les jeunes se considèrent en relation avec la science, tant dans la classe qu’à l’extérieur de celle-ci.

*Mots-clés* : éducation scientifique, loisirs, énergie affective positive, fonds de connaissances, voix des jeunes

## Introduction

In a video they created, Shanice and Kelly—both youth members of Cartier Community Centre’s teen program—describe science as follows:

Shanice: (left of screen): Science isn’t just what we learned in school. It’s cell phones and relationships.

Kelly: (right of screen): Bless!

Shanice: I found out science isn’t just about resistors by having discussions in [ConvoClub].

Kelly: What???

Shanice: Yeah!

Kelly: As a group we discussed that it’s not just boring formulas.

Shanice: Then we interviewed other members of [Cartier] to find out what they thought of science.

(TRANS1Video)

The girls delivering the introduction in a video they created about science use a vernacular and body movement that is typical among the youth at Cartier Community Centre. Throughout the introduction to the video, these youth laugh and move about comically, indicating a desire to entertain. The film then proceeds to various clips of young girls interviewing boys at the community centre about science.

This video clip description demonstrates an example of youth’s positive orientation to a project designed in an afterschool conversation club, ConvoClub, for teenage girls. The introduction to this video demonstrates one of the many examples of the ways youth voice and positive emotional energy were generated through engagement in youth interest-driven science. However, the brief references to cell phones, relationships, and resistors in the introduction to the film also demonstrate the limited content that the youth worked with throughout the activity and how some of the language they rely on signifies their relationship to science. In this article, I will unpack the various ways in which the youth in this program engaged in video projects, and I provide an analysis of the benefits and pitfalls of using primarily self-directed video methods as a means to value youth voice in conversations about science.

Lee and Anderson (1993) have suggested that interactions between cognitive, motivational, and affective factors can influence youth's participation in science, and Seiler (2001) has demonstrated that science based on youth's interests has the potential to lead to high levels of youth engagement in science. Out-of-school-time (OST) science programming has the potential to create environments where youth can engage in scientifically oriented activities that are connected to their persistent interests (Polman & Hope, 2012). These informal spaces provide opportunities for youth to be positioned as leaders in science through engagement in science that includes youth's diverse ways of knowing (Calabrese Barton, 1998). Broadened perspectives of science can create opportunities for youth to begin to see themselves as insiders to science and encourage them to "make connections between their lives, experiences, values, beliefs and science" (Calabrese Barton, 1998, p. 380). These connections can be sites of engagement for youth to express their own voices and begin to situate themselves in emotionally positive ways in science.

This research was designed to explore informal methods to engage youth in science via conversations, video production, and storytelling. Previous research exploring youth's informal engagement in science has identified mini-documentary making as a method by which youth may learn to use their voices and express themselves using imagery, words, movement, and music that is meaningful to them. O'Neill (2010) has shown that storytelling through video can be a powerful tool that encourages youth to create a sense of ownership and engagement with science. Similarly, Furman and Calabrese Barton (2006) have demonstrated that video-making projects can provide opportunities for youth to employ multiple forms of expression (acting, singing, dancing, showing meaningful art, or interviewing) to communicate meaningful understandings of science.

## **Youth Voice and Positive Emotional Energy**

In this study, I regarded opportunities for expressions of youth voice as related to moments of positive emotional energy toward science learning. Thus, creating a space where youth could feel empowered to express their voices was critical to the success of the activities the youth participated in. ConvoClub was a space where adolescent girls gathered with peers and adult volunteers to engage in conversations that were specific

to their interests and concerns. As such, it was already a site that encouraged the expression of youth voice and a concomitant building of positive emotional energy among the participants. Positive emotional energy that emerges from conversational interactions can "determin[e] what each person will feel about the conversation [she] is getting into; how much one wants to talk to the other person...and how successful each will be [in] bringing off the kind of conversation [she] would like to enact" (Collins, 2004, p. 200). Collins's model of emotion and agency was formulated around the study of group dynamics. He developed this concept to examine the extents to which groups develop solidarity around symbols that are then imbued with positive emotional energy. Symbols that bear positive associations to group membership can become sacred objects (Collins, 2004). Recognition of these symbols and participation in sustaining the positive emotional energy imbued in these objects generates cultural capital (Bourdieu, 1986) among those participating in the group, and every conversation in which these symbols are mobilized adds to the cultural capital of the group members. Collins argues that positive emotional energy can contribute to sustained engagement in a learning group.

**Interaction rituals.** Collins (2004) also describes how feelings of group membership and interest in particular activities emerge from series or chains of what he called "successful interaction rituals." These rituals are momentarily shared conversational realities that generate solidarity and symbols of group membership. Collins describes these rituals as "chains of interactions" (p. 198), indicating that they are repeated and reified by the group. The symbols associated with the group membership are given meaning through their mobilization in group conversations and become sacred objects. These sacred objects can be material or virtual, and even the most ordinary objects or ideas can be made sacred by the group through their repeated use and the positive emotional energy associated with them. Olitsky (2007) explored interaction rituals in classroom settings and examined the ways in which science symbols can become invested with emotional energy through successful interaction rituals. She argues that although students may not consider symbols such as textbook images, mathematical symbols, or concepts (the phases of the moon, for instance) to be sacred objects, a successful interaction ritual could still foster feelings of group membership around them. As a result, youth's levels of engagement in science activities or conversations may be related to how emotionally engaged they are in the group.

**Funds of knowledge.** Seiler (2001) has demonstrated that positive emotional energy can be generated in classroom settings where students' funds of knowledge are mobilized. Funds of knowledge that youth bring to the classroom were regarded as experiences, knowledge, and skills that are historically and culturally developed (Moll, Amanti, Neff, & Gonzalez, 1992). Valuing these helps to produce new perspectives of doing science in the classroom that afford student agency and the possibility of restructuring the way in which science is thought about and practised. Building on Seiler's (2001) and Olitsky's (2007) work, I co-constructed activities and conversations with youth that value their voices and relate their funds of knowledge to scientific ways of knowing. Here, I regard interaction rituals as opportunities for expression of youth voice in which sacred objects emerge and are invested with positive emotional energy. These interaction rituals often occurred in tandem with video production or in conversations that were youth-voice driven and involved the mobilization of youth's funds of knowledge.

In this research, I was interested in learning about whether digital storytelling, video production, and conversational activities associated with these projects could create interaction rituals that foreground youth's voices and generate positive emotional energy toward science. Accordingly, I explored these interests through the following researchable questions: (1) In what ways did video production facilitate successful interaction rituals that lead to positive emotional energy among group participants? (2) Did these successful interaction rituals lead to shifts in youth's interest in science?

Following a description of the methodology, I will offer examples of successful interaction rituals that facilitate the expression of youth voice through conversations about science in the ConvoClub. Then, I draw on the follow-up interview data to explore the potential that successful interaction rituals have to contribute to shifts in youth's interest and engagement in science over time and lead to the continued expression of youth voice in practice.

## Methodology

In this article, I focus on a case study of one research site, which was part of a larger multi-sited ethnography involving several OST programs (Marcus, 1998). The stories presented here describe a series of science conversations held at an afterschool program

for teens in a working-class neighbourhood of Montreal. The ConvoClub is a program held every Thursday evening at Cartier Community Centre under the umbrella of the larger Teen Program. It began four years ago when one of the program coordinators, Darlene, noticed that girls tended not to participate fully in the Teen Program and decided to create the ConvoClub to encourage broader participation. The overarching goals of ConvoClub are to provide girls at the community centre a space to discuss "girls' issues," including sexual health and healthy relationships, and to conduct workshop activities around issues of self-esteem and body image.

At the time the present study was conducted, six girls ranging in age from 14 to 19 participated in ConvoClub, two for the first time, and four for the second time. The group met every Thursday evening for two hours, for a period of 12 weeks. Science conversation activities were conducted in the winter of 2011 and were integrated into the ConvoClub. It was understood that the activities would be youth-driven and would consist of video production, story writing, and discussion-based activities around science topics of youth's interest. I facilitated the science- and non-science-related activities around digital storytelling and the mini-documentary making. To ensure confidentiality, pseudonyms are used throughout this article for the youth, the program coordinators, volunteers, and the program itself.

### **Design of Science Activities in ConvoClub**

The research was conducted with design elements in mind (Bell, 2004), wherein the goal was not only to collect ethnographic data but also to implement activities that could help youth develop a connection to science through the expression of their voices and by drawing on their funds of knowledge. ConvoClub started with a digital storytelling project that took six of the 12 weeks of the program, for several reasons: (1) to gradually introduce structured activities to the group; (2) to familiarize the youth with the kinds of digital media we would be using for the science documentary; and (3) to engage the youth in a fun activity that would help us to build rapport with them, reveal something about their lives, and create a sense of bonding within the group. During the digital storytelling, the youth shared personal stories on topics ranging from domestic abuse and siblings' struggles with the criminal justice system to drugs and peer pressure, body

image, and relationships with siblings and parents. After the digital storytelling activities, we then progressed to science-related conversational activities. It is this portion of the ConvoClub programming that I focus on in this article.

I introduced the broad topic of science to ConvoClub during week eight. Inspired by the work of Seiler (2001), I sought not to define science, nor even to introduce pre-prepared science activities, but rather to introduce the theme and see what topics of interest would emerge. We began by discussing everyday activities and asking "Is there science in that?" This led to fruitful conversations about what science is, what counts as science, and whether the youth engage with science in their everyday lives. These conversations, and corresponding collaging activities during weeks nine and 10, led to a further discussion about science and brainstorming about the kind of mini-documentary the girls were interested in pursuing. Once the youth had decided to create a documentary on how others in the community centre thought about science, weeks 11 and 12 were spent interviewing youth in the program about their perceptions of science and storyboarding the film, with the film's final cut and screening taking place during week 12.

## **Data Collection and Analysis**

Data collected throughout the mini-documentary production and science conversations included video ethnographic data, field notes, semi-structured interviews, and artifacts such as collages, storyboards, and the mini-documentary itself.

A content analysis of the field notes, collages, video products, and interview transcripts was conducted (Spradley, 1980; Baker, Green, & Skukauskaite, 2008). From this, moments and exchanges that entailed talk of and about science were identified, along with episodes that were regarded as demonstrating positive emotional energy and instances when youth voice was foregrounded. I identified these episodes as interaction rituals, moments when a common focus on symbols or experiences can generate solidarity among the group of youth and sustain interest and group cohesion for even a brief moment in time. Specific attention was paid to symbolic markers of science—sacred objects—as well as science terminology and language grounded in youth's funds of knowledge (Lemke, 2004). Signs of positive emotional energy were events when youth mobilized their funds of knowledge and demonstrated a shared focus on symbols or semiotic



markers of science. Emotional energy was often communicated verbally or through a rise of energy in youth talk. Analysis of this data (video ethnographic data and interview transcripts) entailed looking for qualitative changes indicating more complex views and details about science, and whether youth's particular views about science were localized in school or out-of-school-time spaces. For this reason, the stories and interaction rituals presented in this article are best thought of as a bricolage resulting from that content analysis and multiple data sources (Kincheloe & Berry, 2004).

Please note: In the transcript notations, square brackets indicate overlapping speech and parentheses indicate emotional expressions. Actions are indicated by double brackets, while curved brackets represent explanations. Transcriptions from video are indicated by (TRANS, number, date, week). Excerpts from interview transcripts are indicated as (INT, date). Excerpts from the final cut of the video are simply noted as (TRANSVideo).

## Results

In this section I present data demonstrating the various ways in which youth engage in interaction rituals that foreground their voices and create positive emotional energy around issues related to science. Drawing on video transcript data, I illustrate how youth voice can be foregrounded through the mobilization of youth's funds of knowledge and the creation of sacred objects. Additionally, to discuss the limitations of the methods used here to generate positive emotional energy related to science, I turn to interview data with participating youth. As I discuss situations emerging from the data, I will refer to the group using the collective term "we" to indicate that the activities and interactions were co-constructed by the group coordinator, the volunteer, the research assistant, the youth, and me.

### Interaction Rituals That Value Youth Voice

Collins (2004) suggests several requirements for an interaction ritual to take place: There must be an assembly of a group in which barriers to the outside world are established. These barriers may be physical or psychological, and generally result in members'

awareness of whether they are inside or outside of the group. There must be a mutual focus of attention on a common activity or object, and there must be a shared emotional experience or mood among the group members. The members of ConvoClub recognized the space as their own and immediately developed mechanisms to establish barriers around the group and demarcate their membership. On one of the early days of ConvoClub, we see the six members of the group sitting around a ping-pong table in the games room at Cartier Community Centre, talking about their day. As a boy from the centre enters the room, one of the girls, Kelly, shouts out, "Do you have a vagina?" The boy replies, "No." Kelly responds with a sarcastic "Bye!" and waves at the door. Following this exchange, Lily—a volunteer at the ConvoClub program—asks why the girls always use the word "vagina" to distinguish themselves from the boys, and whether they had thought of using another term, such as "fallopian tubes":

Lily: It is a good word.

Kelly: [My fallopian tube, yes.]

Shanice: [My fallopian tube.]

Sharon: [Fallopian tube.]

Lily: [Yeah. "Where's] your fallopian tube?" ((giggles))

Sharon: Half will be like "What are you talking about?"

Shanice: It's like exactly. You don't know what it is if you don't have them.

(TRANS1.04.07.11Week7)

Following this interaction, fallopian tubes became a sacred object—generated by sharing common excitement and a ritualistic outcome that became important only to the members of the group who had experienced this collective effervescence. The outcome of this is a sense of solidarity among the group members that supports and encourages the expression of youth voice.

***Youth voice represented in funds of knowledge.*** This conversation segues into one that explores why men who have had sex with men are banned from donating blood at the donor clinics. In this conversation, the girls mobilize their funds of knowledge in ways that both signify their familiarity with scientific knowledge, the relevance it has to

their lives, and their critical engagement in sociopolitical issues related to science. In their conversation, which was largely unmediated by the adults present in the space, questions arose about how the ban had originated, if it might be discriminatory against men who have sex with men, whether tests would screen out the HIV even if it lay dormant, and if men who have sex with men are the only category of people who are not permitted to donate. Eventually, the conversation turned to the discussion of sexually transmitted diseases. Informal conversations about science, such as the one below, not only tended to show considerable positive emotional energy as demonstrated by observable enthusiasm and initiative in debating or exploring ideas, but were also marked by laughter, overlapping speech, and references to personal interests or desires:

Sharon: It's harder to detect like sexual diseases in females.

Allison: Hum.

Sharon: Because everything is inside.

Shanice: Huh! I didn't know that.

Sharon: Learned that in Grade 9 biology class.

Kelly: Monsieur D\_\_\_?

Shanice: I didn't pay attention in Grade 9.

Sharon: Monsieur D\_\_\_\_. [Oh, I love him].

Kelly: [He's so beautiful].

Sharon: And he knows. ((laughter))

(TRANS1.04.07.11Week7)

This conversation drew my attention for a number of reasons. It was an example of positive emotional energy emerging when the girls mobilized their own funds of knowledge and had those validated in the group situation. The conversation also emerged from the girls themselves and was largely unfacilitated by the adults present, constituting a moment when youth voice guided the proceedings of the group. It demonstrated that the girls—perhaps unwittingly—were engaging in science talk and mobilizing their funds of knowledge, despite the fact that most of them had indicated a disinterest in the subject. This informal interaction ritual demonstrated the kind of positive emotional energy I hoped would emerge through our science conversations with the ConvoClub.

***"What science means to me": Constructing sacred objects.*** Throughout the ConvoClub sessions, youth were repeatedly challenged to think about whether they engaged in science in their everyday lives. However, generating examples through youth's conversations proved to be difficult, as science was often thought about in canonical (school science) terms like "wires and resistors" (Kelly, TRANS3.04.07.11 Week8). Part of our struggle was to move beyond classical ways of thinking about science and to broaden our collective notions about what we "count" as science to include youth's funds of knowledge. To explore the other ways in which science might connect to girls' lives in informal ways, and to create opportunities where youth voice might be foregrounded, we introduced an art activity to the program and encouraged the youth to create collages around the theme "what science means to me." That activity constructed the sacred objects used by the group to connect science to their lives and to increase their positive emotional energy. Two of the sacred objects that the youth co-constructed and connected to were relationships and communication technology. These objects were held sacred because they were tied to youth's everyday experiences and were meaningful to them. The following two vignettes describe how these sacred objects emerged and created interaction rituals that led to positive emotional energy among the youth.

**Relationships as sacred objects.** We asked the youth to present the collages to the group, and explain why they had chosen the images and words to represent science. This activity was designed to encourage the youth to explain their ways of thinking and to make room for youth voice in science. Across the collages, the idea of relationships emerged as a common thematic element. This led to several discussions regarding how we might connect relationships to science. Together, we decided that the "psychology of relationships" could count as science. In her collage presentation, Shanice discusses sexuality and relationships, referring to a teacher who once told her that the study of relationships is "still like a science." Shanice's use of symbols related to relationships began a cascade of talk that repeatedly referred to relationships as related to science:

Shanice: Let me show you my little work here. OK, focus. For me— like when you started talking about science, at first I was like "Man, like, I really don't like science," but then, like, it clicked in my head that it's not just, like, chemicals and blah blah blah and I thought it hum—'cuz I took a class uh—sexuality and

relationships and it was a humanities class but she was, like, explaining how it’s still like a science and since—when I thought of it I put it on ah—my board, so... yeah, there’s a lot of sexuality and relationships on my board. (Shanice giggles)

...

Shanice: And I have a little molecule there. It’s about science class. And the bubbles. (Shanice laughs)

Caileigh: Hum. Something [for everyone].

Darlene: [These dudes] are [molecules]?

(giggles)

Shanice: [Well, yeah], ’cuz science is something for everybody.

Caileigh: Aaaw.

Shanice: And so is that guy right there.

(laughter)

Allison: When you just said science is something for everybody...

Shanice: Yeah, there’s something for everybody in science, ’cuz I’m not big on science, but when I remembered that it could be like psychology and relationships, like with people, and made it that much more interesting to do. (Shanice smiles)

(TRANS4.04.14.11Shi)

The topic of relationships, and particularly sexuality, was popular among the youth, many of whom were experimenting with their burgeoning sexualities and often brought stories about love and sex to the ConvoClub. Repurposing science in such a way that enabled the youth to talk about some of the issues they were dealing with in their personal lives generated a great deal of positive emotional energy, which created rapport among the group members and an interest in continuing to pursue these types of conversations.

**Cell phones as sacred objects.** The concept of communication technology emerged in Sarah’s collage presentation. Sarah had recently become the owner of a BlackBerry cell phone and used it frequently to text with her friends and family. She talked a great deal about her interests in communication technology and discussed her desire to get an iPad, even though she had never used one before. Sarah’s collage contains

a sparse arrangement of images, one of which is an advertisement for a cell phone company. She describes this image:

Sarah: OK. Well, I just got a BlackBerry, so I like that one. That one ((pointing at an image of monkeys using a cell phone)). Looks like monkeys are communicating, I think. Yeah. And it all has to do with technology, which is science.

...

Allison: What is it about technology that you find so interesting?

Sarah: The fact that you can like press buttons and then all of a sudden you’re getting what you press. That’s pretty cool.

(TRANS1.04.14.11S)

This very simple representation of an object is associated with youth’s persistent interests (almost every session with the ConvoClub included discussions about “BBM-ing”—BlackBerry messaging their friends) and, once introduced, cell phones became another sacred object for the group. It was very common for girls to gather around each other’s cell phones and giggle about texts they had received. This brief dialogue around communication technology helped transform it into a topic in science that we could explore further together, in the mini-documentary.

As shown, the collage activity can be thought of as an interaction ritual that led to the creation of sacred objects (relationships and communication technology) grounded in youth’s funds of knowledge. That activity enabled opportunities for youth to mobilize their voices as they explored what counts as science. Creating these spaces for youth voice helped to generate positive emotional energy around science and also made transparent youth’s ideas around science grounded in their everyday activities.

***Mini-documentary making.*** The mini-documentary was a project the girls embarked upon to share their new knowledge of science, grounded in their everyday lives, with the boys in the centre. The format for the video was developed entirely by the girls in the ConvoClub, with input from the researchers and volunteers about the process (filming techniques, development of interview questions, help with editing). The girls decided to interview the boys in the centre around the theme of “everyday science” to see

their responses to questions like "Do you know that you do science every day?" or "What scientific question would you most like to know the answer to?"

In the mini-documentary, we see repeated references to cell phones—a sacred object for the group—mobilized in ways that appear meaningful to the girls, but may not have had the same significance to the boys participating in the interview. The two excerpts below are transcripts from the interviews the girls performed with teen boys at the Cartier Community Centre:

**CLIP 1**

Sarah: When you hear the word "science," what comes to mind?

Boy 1: Fun.

Sarah: Why?

Boy 1: Because I like science.

Sarah: Did you know that you do science every day at school?

Boy 1: I didn't know that.

Sarah: For example, just practically walking down the street. Do you have a cell phone?

Boy 1: Yeah.

Sarah: That's science, right there.

(TRANS2Video)

**CLIP 2**

Karen: Did you know that you use science every day outside of school?

Boy 2: Hmm, yeah.

Karen: Yeah? Can you give me an example?

Boy 2: Uh, let's see. I don't know, but like, I do know that you use science after...

Karen: Do you have a cell phone?

Boy 2: Yeah.

Karen: That's science.

Boy 2: There you go.

(TRANS3Video)

In both of these excerpts, Sarah and Karen position themselves as experts in science—a science grounded in and emergent from their funds of knowledge. We see the girls challenging the boys to identify examples of everyday science and then identifying the sacred object, the cell phone, as a signifier of their position as experts of science. Interestingly, the cell phone is a signifier for science only for the girls who are insiders to the kind of science talk we had engaged in at ConvoClub that made the sacred object significant to them. The use of sacred objects in this way raises questions about the extent

to which the girls are engaging with science versus their engagement with signifiers of science unique to and accessible to them only as members of the ConvoClub. I explored these questions in interviews with the girls at the end of the ConvoClub activities.

### **Sustaining Positive Youth Engagement with Science**

The interaction rituals described above represent a good start toward generating positive emotional energy about science, and finding ways to cultivate the expression of youth voice in informal learning spaces. The shared sense of ownership that emerged through the making of the mini-documentary created a space for youth to mobilize their funds of knowledge in ways that were recognized by the group. However, I questioned whether the positive emotional energy we observed was generated by the science or by the activities used to engage youth in science conversations. For this reason, follow-up interviews were conducted to determine if there was evidence that the youth had developed a sustained interest in science.

Follow-up interviews with the girls revealed that, although the interaction rituals appeared to generate emotional energy in the moment, they may not have encouraged sustained interest in everyday science. Based on our follow-up interviews, many of the sacred objects or symbols of emotional energy that we had identified as facilitators of entrainment in interaction rituals seemed not to hold significant importance for the girls outside of the space of the ConvoClub. As an example, in a follow-up interview with Kelly, I inquired whether she carried forward a sustained interest in science:

Allison: Oh, OK. How important is science to you?

Kelly: Not really that important.

Allison: No? Why not?

Kelly: 'Cuz I don't (pause) do the real science.

Allison: OK—the real science.

Kelly: Yeah.

Allison: So...

Kelly: Like in school. I text, I use the computer. So. [That's science.]



Allison: [OK.] That’s science. Is {what we talked about in ConvoClub} real science?

Kelly: [N]o.

Allison: Why not?

Kelly: ’Cuz there’s no wires and connections, chemicals.

Allison: OK. Is that like—is the science that we were talking about in ConvoClub different to real science, you think?

Kelly: Yeah.

(INT.08.08.11K)

Kelly references the interaction rituals that had generated positive emotional energy about communication technology and refers to cell phones (texting) as a sacred object that emerged through our conversations, but she does not regard this as engagement in “real science.” This response indicated not only a sustained indifference toward science, but also a sense of suspicion toward the methods used in ConvoClub to mobilize youth voice and generate positive emotional energy toward science. Interestingly, Kelly discredits the conversations held in ConvoClub by referring back to her original proclamation that science is about “wires and connections, chemicals.” Thus, we are left with the idea that the interaction rituals which seemed to value youth voice and generate positive emotional energy among the group members may not have purchase in science-related interaction rituals outside of the ConvoClub. Put another way, the creation of opportunities for youth to express their voices and draw on their funds of knowledge in informal learning situations did not guarantee that youth would then feel empowered to do the same in other learning environments. This raises the question of whether these successful interaction rituals are tied too strongly to their temporal and spatial environments in which youth voice and funds of knowledge are supported. This interpretation, however, is tied to the follow-up interviews, and thus it is not possible to speculate on the long-term effects of the ConvoClub activities on youth’s continued participation in science.

## Discussion

In this article I have presented evidence that opportunities for youth to express their voices through digital media projects have the potential to reconstruct ideas about science to include examples from girls' everyday lives. The examples presented here demonstrate that group solidarity can form around sacred objects in interaction rituals that may lead to positive emotional energy. I regarded these instances of positive emotional energy as episodes indicative of the expression of youth voice and mobilization of youth's funds of knowledge. Science learning has been shown to occur when youth express themselves in ways that enable them to become fuller members of a science-related group or community, or when youth use their voices to position themselves as knowledgeable in relation to a group of science learners (Furman & Barton, 2006). The results presented in this article demonstrate that the use of digital technology to capture these instances of youth voice also created interaction rituals that generated positive emotional energy around science, attesting to an interesting synergy among youth voice and emotion, conducive to participation in content or practices otherwise outside of reach for youth, as is often the case with science.

This framework can help us understand how common experiences and symbols, when introduced in the context of science learning (or better yet, when emergent from the youths' own conversations) can generate the solidarity necessary for a successful interaction ritual. Olitsky (2007) found that in a Grade 8 classroom, physics problems that incorporated popular sports figures, movies, or television programs "generated more focused concentration, laughter, attunement to each other's movements and student contributions to the discussion than problems that only used canonical language" (p. 37). However, Olitsky also found that some of the symbols used did not produce solidarity that lasted longer than the duration of the particular problem. This often happened when the symbols introduced came from the teachers, rather than the students. Seiler (2001) also suggested that teacher-led efforts to connect science to students' lives are often not sufficient to generate sustained interest and may be perceived as inauthentic. However, when students are given opportunities to mobilize their own funds of knowledge and when these forms of engagement are validated, increased focus and positive emotional energy can be observed within the same classrooms.

This study suggests that the legitimacy of forms of science engagement is tied to youth's perceived authenticity of them. The activities we introduced to the program were successful in creating interaction rituals where youth's voices could be heard and positive emotional energy could be generated. However, these instances did not appear to hold much promise for sustained interest in science. Part of this failure resides in the tension that appears to exist between youth's concepts of "everyday science" in relation to the canonical science that they learn in school, and the authenticity that is then conferred upon efforts to disrupt this perception in informal environments. Gonsalves, Rahm, and Carvalho (2013) have reported that youth's engagement in and identification with science may have spatial and local dimensions, pointing to a need to deconstruct the dichotomization of school science and informal science. Seiler and Gonsalves (2010) have suggested that this dichotomy emerges from teachers' and students' notions of what counts as "real science." They describe the notion of "real science" as activities that are prescribed and guided by teachers and that are synchronous with "real teaching." Science activities and ideas that were encouraged to emerge from the students themselves where met with skepticism and distrust, and although they may have been fun, in this case they were not regarded as legitimate or authentic by the students. This appears to be the crux of the matter when designing science experiences that support youth voice: how to create science learning environments that are authentic and legitimate in not only the eyes of youth but also society at large, and that at the same time draw on youth's funds of knowledge and generate positive emotional energy. In the conclusions, I suggest some solutions and areas for further research.

## Conclusions

Youth's funds of knowledge and youth voice are often overlooked as valid places to begin science learning (Brickhouse & Potter, 2001). In OST programs, as well as in classrooms, youth are likely to encounter teachers or significant adults who are unable to make the connections between youth's funds of knowledge and science in ways that produce successful interaction rituals (Olitsky, 2007). Conversely, as demonstrated here, science practices in OST programs can be undervalued or regarded as not scientific enough. The challenge for teachers, researchers, and program coordinators in OST spaces is to find

ways to develop interaction rituals that foreground youth voice and draw on their funds of knowledge in ways that can generate positive emotional energy, which may lead to sustained interest in science (Seiler, 2001). OST programs in particular have the potential to disrupt representations of science as disconnected from youth's lives, as they provide possibilities for deeper exploration of issues related to youth's persistent interests (Rahm, 2010; Bell, Lewenstein, Shouse, & Feder, 2009).

However, in this article I have identified a challenge for science educators both in classroom and OST settings: to find a way to draw on youth's funds of knowledge in ways that can generate positive emotional energy, and to simultaneously validate these forms of knowledge in ways that are regarded as legitimate not only by youth but also by outsiders and across contexts (informal–formal science). In other words, there is a need to find ways to legitimize youth's voices as they bring their own experiences to science classrooms and informal learning environments. As a solution, Tan and Calabrese Barton (2010) describe pedagogical strategies that one teacher initiated to create a bridge between youth's out-of-school and in-school science experiences. Among these, one strategy entailed creating spaces for youth voice by soliciting youth stories and out-of-school resources, valuing and highlighting youth's artifacts, and sharing one's own personal stories and experiences. In this study, the lack of sustained identification with science points to the importance of further work of this kind. One place to start would be to critically examine the power among different interaction rituals both in and out of the classroom and the possibilities that these hold to value youth's voices in ways that generate both positive emotional energy and sustained science learning.

This study is an example of a program that was based not on science activities but on talking, building relationships, and generating opportunities for youth to identify with science learning through group membership. I see this kind of program as a new opportunity to move toward dismantling perceptions of the nature of science as abstract, rigid, and laboratory-based. We have demonstrated that conversation groups about science that value youth voice have the potential to generate interaction rituals that lead to the positive emotional energy needed among group members to develop an interest in science. However, I caution that sustained interest in science may come only with a time investment that permits a prolonged and critical exploration of the structures validating certain forms of youth engagement in science and not others. Finding strategies to support and value youth voices in science in ways that might be legitimated in the classroom and in OST

spaces is a challenge for researchers and teachers interested in teaching science for social justice.

### **Acknowledgement**

The study was supported by a post-doctoral grant from the Federal Council of Research in Society and Culture (FQRSC) to Allison Gonsalves, and a grant from the Social Sciences and Humanities Research Council (SHRC) to Jrène Rahm and Allison Gonsalves.

## References

- Baker, W. D., Green, J. L., & Skukauskaite, A. (2008). Video-enabled ethnographic research: A micro ethnographic perspective. In G. Walford (Ed.), *How to do educational ethnography* (pp. 76–114). London, England: Tufnell Press.
- Bell, P. (2004). On the theoretical breadth of design-based research in education. *Educational Psychologist*, 39(4), 243–253.
- Bell, P., Lewenstein, B., Shouse, A., & Feder, M. A. (Eds.) (2009). *Learning science in informal environments: People, places and pursuits*. Committee on Learning Science in Informal Environments. National Research Council. Board of Science Education. Division of Behavior and Social Science and Education. Washington, DC: National Academies Press.
- Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). New York, NY: Greenwood Press.
- Brickhouse, N. W., & Potter, J. T. (2001). Young women’s scientific identity formation in an urban context. *Journal of Research in Science Teaching*, 38, 965–980.
- Calabrese Barton, A. (1998). Teaching science with homeless children: Pedagogy, representation, and identity. *Journal of Research in Science Teaching*, 35, 379–394.
- Collins, R. (2004). *Interaction ritual chains*. Princeton, NJ: Princeton University Press.
- Furman, M., & Calabrese Barton, A. (2006). Capturing urban student voices in the creation of a science mini-documentary. *Journal of Research in Science Teaching*, 43, 667–694.
- Gonsalves, A., Rahm, J., & Carvalho, A. (2013). “We could think of things that could be science”: Girls’ re-figuring of science in out-of-school-time clubs. *Journal of Research in Science Teaching*, 50, 1068–1097.
- Kincheloe, J., & Berry, K. (2004). *Rigour and complexity in educational research: Reconceptualizing the bricolage*. London, England: Open University Press.

- Lee, O., & Anderson, C. W. (1993). Task engagement and conceptual change in middle-school science classrooms. *American Educational Research Journal*, 30, 585–610.
- Lemke, J. (2004). The literacies of science. In E. Wendy Saul, (Ed.), *Crossing borders in literacy and science instruction* (pp. 33–47). Arlington, VA: NSTA Press.
- Marcus, G. (1998). *Ethnography through thick and thin*. Princeton, NJ: Princeton University Press.
- Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice*, 31(2), 132–141.
- Olitsky, S. (2007). Promoting student engagement in science: Interaction rituals and the pursuit of a community of practice. *Journal of Research in Science Teaching*, 44(1), 33–56.
- O’Neill, T. (2010). Uncovering student ownership in science learning: The making of a student created mini-documentary. *School Science and Mathematics*, 105(6), 292–301.
- Polman, J., & Hope, J. (2012, March). *Citizen science journalism: A pathway to developing a scientifically literate and engaged public?* Poster session presented at the annual meeting of the National Association for Research in Science Teaching, Indianapolis, IN.
- Rahm, J. (2010). *Science in the making at the margin: A multisited ethnography of learning and becoming in an afterschool program, a garden, and a Math and Science Upward Bound program*. Rotterdam, Netherlands: Sense Publishers.
- Seiler, G. (2001). Reversing the “standard” direction: Science emerging from the lives of African American students. *Journal of Research in Science Teaching*, 38, 1000–1014.
- Seiler, G., & Gonsalves, A. J. (2010). Student-powered science: Science education for and by African American students. *Equity & Excellence in Education*, 43, 88–104.
- Spradley, J. P. (1980). *Participant observation*. Orlando, FL: Harcourt Brace Jovanovich College Publishers.

Tan, E., & Calabrese Barton, A. (2010). Transforming science learning and student participation in sixth grade science: A case study of a low-income, urban, racial minority classroom. *Equity & Excellence in Education*, 43, 38–55.